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Service Paper

A manual of public health for students and practitioners of mortuary science.

BOSTON UNIVERSITY SCHOOL OF EDUCATION

Service Paper

A MANUAL OF PUBLIC HEALTH

FOR STUDENTS AND PRACTITIONERS OF MORTUARY SCIENCE

Submitted By

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I. GENERAL INTRODUCTION

> "History is so connected with, and essential to, all kinds of knowledge, that the most superficial essay upon any subject whatever, is hardly tolerable, unless some kind of historical facts are introduced, or alluded to in it."
>
> Priestly

A. The Problem: Importance and Need.

Public health and sanitary science have attained national prominence in the field of mortuary science, during the past few years. As a result the teaching of public health is assuming a rather important position in the curriculum of the modern college of mortuary science.

At the present time no textbook or manual of any kind is available to adequately fit the specific and professional needs of the student and the practitioner of mortuary science. This manual is designed to meet the needs of students of embalming and to serve as a source of reference for licensed practitioners in the field, where in spite of many reference books and voluminous scientific data, no adequate textbook for students of mortuary science is available.

A textbook in Public Health is a vast field of endeavor and is too broad in scope to justify its use in a college of mortuary science. The manual therefore is limited to those particular aspects of public health and sanitary science that

are absolutely essential for the student and practitioner of mortuary science. The content of this manual includes those specific items that have been outlined as essential by the National Association of Colleges of Mortuary Science committee on Syllabus content.

The primary object of the manual is to place before the student of embalming and funeral directing the means and the methods used in an attempt to control the possible spread of disease, not only from the living, but also from the dead human body which could become a source of contamination.

The manual is not an exhaustive treatise, but is intended to serve as a foundation on which the student may build a more complete knowledge of the subject.

B. Historical Background.

The field of public health lends itself particularly well to the historical approach because of its youth. As a social science it is barely a century old and as a subject included in the curriculum of colleges of Mortuary Science it exists as such barely a decade. Its roots, however, extend into antiquity.

1. Mosaic Law. The first sanitary code of which there is any knowledge is found in the Biblical account of the

Mosaic Law.[1]/ In the light of present knowledge much of its information appears crude, but many of our public health practices have been built upon this early foundation.

Isolation for communicable diseases required that the individual should dwell alone outside the camp until the priest had pronounced him clean. Precautions to be taken before release from isolation included bathing, shaving hair, and washing clothes after a period of at least a week. These simple rules illustrate the important principle of protecting the public health of a community by requiring an individual with a suspected communicable disease to be separated from his fellow men.

The food requirements of the Mosaic Law gave strict directions as to what might or might not be eaten by the people, with dire penalties for any transgression. It has its counterpart in the present day Food Laws which restrict the sale and preparation of food products within the jurisdiction of the body making the regulations, and which do not function beyond the corporate limits of that particular division.

2. Greek Influence. While Greek law and custom laid no great stress on rules of public health, Hippocrates (460-377 B.C.), the "Father of Medicine," wrote a treatise on

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[1]/C. F. Bolduan and N. W. Bolduan, Public Health and Hygiene (Philadelphia, W. R. Saunders Company, 1942), pp. 1-3.

"Airs, Waters, and Places," which gave consideration to the influence of environment on health.[1] The Greek concepts of the causes of disease, while logical and ingenious, were largely based on what we now know to be false premises. Since these conceptions held sway for many centuries, even up to the eve of the Middle Ages in Europe, it is easily understood why the scientific development in this field did not begin until a true knowledge of the causes of disease was attained through the science of bacteriology. To the Greeks, however, we do owe the ideal of a sound body, to be attained through proper physical training, and with them we also find the germ of the idea of hospitalization. The ideal form of a Greek Sanatorium was that of the Aesculapieion at Cos which was situated and constructed with strict attention to suitable location, water supply, and proper air and ventilation.[2]

3. Roman Empire. With the mechanically-minded Roman civilization, one branch of public health activity, namely, sanitary engineering, took great steps forward. Vitruvius, one of the great Roman engineers, about 25-20 B.C., laid

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[1] Ibid., pp. 2-3.

[2] Birkeland, J. Microbiology and Man (Baltimore Williams and Williams, 1942), pp. 1-3.

stress on the abundance and purity of the water supply for the community.[1] Rome itself boasted of an immense stone aqueduct which brought water to the city from the hills some thirty miles away. This was only one among many and even today a traveler can see concrete evidence of the influence of Roman aqueducts in Asia Minor, Africa, and Spain.

The city of Rome also constructed a system of sewerage by means of which every street in Rome was drained into the Tiber River; the largest of these, the "Cloaca Maxima", is still in use and is well preserved.

All the larger cities had paved streets and public baths, and there is evidence to point out that some of them even provided for the periodic removal of refuse.

4. The Middle Ages. The views and practices of the Roman Empire held sway in the western world up to about 200-300 A.D., and then progress ceased. The conditions of the towns were immeasurably inferior to those of the Roman Empire; in the country they can only be described as semi-barbaric. The growth of large towns at a time when the merest rudiments of sanitary science were unknown, and when medical skill was synonymous with superstitious quackery, was a fruitful source of devastating disease.[2]

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[1] C. F. Bolduan and N. W. Bolduan, Public Health and Hygiene (Philadelpgia, W. B. Saunders Co., 1942), p. 4.

[2] Ibid., p. 5.

During the Middle Ages, as a result of vast mobilization of nations in the crusades, leprosy became widespread in Europe. Edicts were promulgated which prescribed the isolation of lepers. By the 12th century isolation camps were found in nearly all parts of Europe.

The idea of "contagion" had became implanted in the minds of the physicians by the 13th century.[1/]

In the latter half of the 14th century and the beginning of the 15th, the "Black Death" raged in Europe. To prevent its spread Venice, Ragusa, Marseilles and Genoa, the chief maritime cities of the Mediterranean, adopted and enforced a 40 day detention period of all vessels entering their ports (1377-1403). This marked the beginning of quarantine methods, the word derived from "quadragintia", which means 40.[2/]

With no scientific knowledge of the nature of disease, little progress could be made with the various epidemics which devastated Europe.

Many physicians of the time accepted the teachings of the Greek practitioner Galen (130-200 A.D.) who assigned two causes to pestilences.[3/]

1/ Ibid., p. 6.

2/ L. Gershenfeld, Bacteriology and Sanitary Science (Lea and Febiger, Philadelphia, 1933), p. 307.

3/ C. F. Bolduan and N. W. Bolduan, Public Health and Hygiene (W.B.Saunders Co.,Philadelphia, 1942), p. 8.

(1) Great irregularity in the seasons and a consequent pestilential state of the air.

(2) A vitiated condition of the human body due to corrupt and defective food.

While Galen's Teachings contained much that was sound, they were organized into so rigid a system that they greatly impeded original observation and independent thought even through the Middle Ages.

5. Revival of Learning to Modern Times. The following list represents a chronological study of those men and women who have contributed significantly to the present knowledge and teachings of Public Health.[1]

1483-1553. GIROLAMO FRACASTON - Published a work "De Contagione" in which he promulgated the idea that certain diseases were spread by "seeds".

1495-1541. PARACELSUS - His thesis on Miner's Disease, the first treatise on industrial disease, was published in 1567.

1578-1657. HARVEY - Discovered the circulation of blood, function of the heart, and the role of arteries and veins.

1602-1680. ATHANASIUS KIRCHER * probably the first to employ the microscope in investigating the cause of disease.

1632-1723. ANTONY van VEEUWENHOEK - The "Father of Bacteriology," first accurately described the arrangement of bacteria.

1749-1823. EDWARD JENNER - In 1796 he performed a vaccination against smallpox.

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[1]C. F. Carter, Microbiology and Pathology (St. Louis, C. V. Mosby, 1944), pp. 33-38.

1820-1910. FLORENCE NIGHTINGALE - Led in hospital reforms and put nursing on a strictly professional basis.

1822-1895. LOUIS PASTEUR - A French chemist noted for pasteurization of milk, development of anthrax vaccine, and a treatment for rabies.

1827-1912. JOSEPH LISTER - Devised operating-room procedures calculated to destroy microorganisms. Called "The Father of Antiseptic Surgery."

1843-1910. ROBERT KOCH - Discovered anthrax bacillus and restated certain principles relating to the germ theory of disease which are called "Koch's Postulates."

1846. Semmelweiss - Recommended that chlorinated lime be used to destroy poisons for the infection of puerperal sepsis by thoroughly washing and soaking the hands in solution before treating and examining women in labor.

1882 ELIE METCHNIKOFF - Proposed the phagocytic theory of immunity.

1896 . GRUBER and WIDAL - Discovered the phenomenon of agglutination.

1900-1902. REED A. GRAMONTE and LAZAR - Discovered that the mosquito was a vector of yellow fever.

1908. JOHNSON - Discovered that chlorination of water reduced the incidence of typhoid fever.

1910. EHRLICH - Discovered a specific drug for the treatment of syphilis.

C. VITAL STATISTICS.

The average beginning student in mortuary science approaches vital statistics with apprehension and distrust. The formulas and tables are dull and uninteresting and bear little relationship to the work of the embalmer.

It is only when he begins to read the current literature in trade and professional journals that his interest

is aroused, for he soon realizes that the conclusions that are drawn from experimental investigation must be interpreted on a statistical basis.

Vital statistics have an essential place in the field of public health. Without a continuous and adequate compilation and interpretation of vital facts, all work in public health would be carried out blindly and ineffectively.

Vital statistics is the science which considers the application of numerical methods to vital facts. It is essentially a measurement of achievement in human happiness and human welfare.

1. Population Statistics. Population upon which all vital statistics are based is determined by a federal census enumeration at ten year intervals; for the non-census years the population must be estimated. This estimate is generally determined by: [1]/

a. Arithmetic Method - Assumes a constant amount of increase between the census years and is commonly used by public health statisticians. The population for a given year between the two census years is calculated as follows:

YEAR	POPULATION
1940	6,100,000
1930	5,851,400
10 years =	248,600
1 year =	24,600
1 month =	2,050

1/ Smillie, W. G. Preventive Medicine and Public Health (New York, Macmillan Co., 1946), p. 32.

By multiplying the number of months intervening and adding to the 1930 figures, the probable population for any date may be determined.

b. Geometric Method.[1]/ Gives a more exact means of determining future estimates in population based on previous trends, providing a series of actual population is available.

c. Graphic Methods.[2]/ The population for intercensal years or for future years may be estimated by plotting the past growth on coördinate paper and then projecting the curve for future years, after making due allowances for probable future growth from comparisons with similar large communities.

2. Birth Statistics.[3]/

a/ The crude birth rate per 1000 population is determined by the formula:

$$\frac{\text{Recorded Births}}{\text{Total population}} \times 1000$$

b. The specific birth rate is determined in the same way.

$$\frac{\text{Recorded Births}}{\text{Women between 15-45}} \times 1000$$

c. Marriage and divorce rate is determined in the same way.

1/ Smillie, op. cit., p. 32.

2/ Smillie, op. cit., p. 33.

3. Smillie, op. cit., p. 39.

3. Morbidity Statistics. Certain specific diseases are of importance because of their danger to public health and require reporting by physicians. The local boards of health collect the morbidity reports of the specific diseases and send them to the State Department of Public Health. These "specific diseases" are notifiable and include both infectious and occupational diseases. The amount of information requested on these reports by the physician varies with the different boards of health. A good report generally includes,

a. Date
b. Disease
c. Name, age, sex. address
d. Occupation
e. Number in family
f. Probable source of infection
g. Name and address of physician.

The morbidity rate is determined by the formula: [1]/

$$\frac{\text{Recorded cases of Given Disease}}{\text{Total population}} \times 100{,}000$$

4. Mortality Statistics.[2]/ The registration of deaths with their causes must be complete and based upon the standard nomenclature in the international list of causes of death. Mortality statistics are based upon original data obtained by the registration of deaths through the filing of

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1/ Smillie, op. cit., p. 40.

2/ Hall, H. F. Public Health Statistics (New York, Paul Hoeber, 1942), pp. 29-33.

death certificates by physicians with the city clerk directly or indirectly through the Board of Health.

a. The crude death rate per 1000 population is determined by the formula:

$$\frac{\text{Recorded deaths}}{\text{Total population}} \times 1000$$

b. The maternal death rate is the number of mothers dying from child birth per 1000 live births in the community.

c. The still birth rate is the number of still births during a given year per 100 live births in a community.

d. The infant mortality rate is determined by the formula:

$$\frac{\text{Recorded deaths under one year (exclusive of still births)}}{\text{Total recorded births}} \times 1000$$

e. The specific death rate is determined by the formula:

$$\frac{\text{Recorded deaths from given cause}}{\text{Total population}} \times 100{,}000$$

f. The fatality rate of a notifiable disease is determined by the formula:

$$\frac{\text{Recorded deaths from given diseases}}{\text{Recorded cases of given disease}} \times 100$$

Death registration serves as evidence in the inheritance of property and in the settlement of Life Insurance. It is useful in preventing crime through the restriction

placed upon the disposal of dead human bodies and insures a permanent and uniform record of the death of each individual for both personal and legal reasons.[1]/

The Death Certificate is a report by the physician who attended the deceased during his last illness. The law provides that a body of a deceased person may not be buried, cremated, shipped, or otherwise disposed of without a permit from the proper authorities. This law is strictly enforced throughout the United States.

The following death certificate is the standard death certificate for the State of Massachusetts and is representative of the type used throughout the country.

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[1]/ Greenhood, E. R. Mortuary Law and Settlement of Estates (Boston, E. R. Greenhood, 1939), pp. 7-8.

STANDARD CERTIFICATE OF DEATH

FORM R-301 A

MARGIN RESERVED FOR BINDING

N. B. — WRITE PLAINLY, WITH UNFADING BLACK INK — THIS IS A PERMANENT RECORD. Every item of information should be carefully supplied. AGE should be stated EXACTLY. PHYSICIANS should state CAUSE OF DEATH in plain terms, so that it may be properly classified. Exact statement of OCCUPATION is very important. See instructions and extracts from the laws on back of certificate.

If deceased was a U. S. War Veteran, G. L. Chap. 46, Section 10, requires physicians to insert a recital to that effect.

100M-7-46-19068

1 PLACE OF DEATH ..... (County) ..... (City or Town)

The Commonwealth of Massachusetts
OFFICE OF THE SECRETARY
DIVISION OF VITAL STATISTICS
STANDARD
CERTIFICATE OF DEATH

To be filed for burial permit with Board of Health or its Agent.

Registered No. .....

No. ..... St. { (If death occurred in a hospital or institution, give its NAME instead of street and number) }

2 FULL NAME ..... { PHYSICIAN - IMPORTANT (Was deceased a U. S. War Veteran, if so specify WAR) .....
(If deceased is a married, widowed or divorced woman, give also maiden name.)

(a) Residence. No. ..... St. .....
(Usual place of abode) (If nonresident, give city or town and State)

Length of stay: In hospital or institution ..... years months days. In this community yrs. mos. days.
(Before death) (Specify whether)

PERSONAL AND STATISTICAL PARTICULARS

3 SEX	4 COLOR OR RACE	5 SINGLE (write the word) MARRIED WIDOWED or DIVORCED

5a If married, widowed or divorced
HUSBAND of .....
(Give maiden name of wife in full)
(or) WIFE of .....
(Husband's name in full)

6 Age of husband or wife if alive ..... years

7 IF STILLBORN, enter that fact here.

8 AGE Years	Months	Days	If less than 1 day Hours	Minutes

9 Usual Occupation: .....

10 Industry or Business: .....

11 Social Security No. .....

12 BIRTHPLACE (City) .....
(State or Country)

PARENTS

13 NAME OF FATHER

14 BIRTHPLACE OF FATHER (City) .....
(State or Country)

15 MAIDEN NAME OF MOTHER

16 BIRTHPLACE OF MOTHER (City) .....
(State or Country)

17 Informant ..... (Relation, if any)
(Address)

I HEREBY CERTIFY that a satisfactory standard certificate of death was filed with me BEFORE the burial or transit permit was issued:

.....
(Signature of Agent of Board of Health or other)

.....
(Official Designation) (Date of Issue of Permit)

MEDICAL CERTIFICATE OF DEATH

18 DATE OF DEATH .....
(Month) (Day) (Year)

19 I HEREBY CERTIFY, That I attended deceased from
....., 19....., to ....., 19.....
I last saw h..... alive on ....., 19....., death is said to have occurred on the date stated above, at ..... m.

Duration IMPORTANT

Immediate cause of death .....

Due to .....

Due to .....

Other conditions .....
(Include pregnancy within 3 months of death)

Major findings:
Of operations .....
Date of .....
Of autopsy .....
What test confirmed diagnosis? .....

IMPORTANT
Physician
Underline the cause to which death should be charged statistically.

20 Was disease or injury in any way related to occupation of deceased? .....
If so, specify .....
(Signed) ....., M. D.
(Address) ..... Date ..... 19.....

21 .....
Place of Burial, Cremation or Removal. (City or Town)
DATE OF BURIAL ..... 19.....

22 NAME OF FUNERAL DIRECTOR .....
ADDRESS .....

Received and Filed ..... 19.....

.....
(Registrar)

EXTRACTS FROM THE LAWS OF THE
COMMONWEALTH OF MASSACHUSETTS
GOVERNING THE

RETURN OF CERTIFICATES OF DEATH

A physician or registered hospital medical officer shall forthwith, after the death of a person whom he has attended during his last illness, at the request of an undertaker or other authorized person or of any member of the family of the deceased, furnish for registration a standard certificate of death, stating to the best of his knowledge and belief the name of the deceased, his supposed age, the disease of which he died, defined as required by section one, where same was contracted, the duration of his last illness, when last seen alive by the physician or officer and the date of his death . . . Gen. Laws, Chap. 46, Sec. 9.

A physician or officer furnishing a certificate of death as required by the preceding section or by section forty-five of chapter one hundred and fourteen, shall, if the deceased, to the best of his knowledge and belief, served in the army, navy or marine corps of the United States in any war in which it has been engaged, insert in the certificate a recital to that effect, specifying the war, and shall also certify in such certificate both the primary and the secondary or immediate cause of death as nearly as he can state the same. For neglect to comply with any provision of this section, such physician or officer shall forfeit ten dollars. For the purposes of this section and of sections forty-five, forty-six and forty-seven of said chapter one hundred and fourteen, the word "war" shall include the China relief expedition and the Philippine insurrection, which shall, for said purposes, be deemed to have taken place between February fourteenth, eighteen hundred and ninety-eight and July fourth, nineteen hundred and two, and the Mexican border service of nineteen hundred and sixteen and nineteen hundred and seventeen. G. L. Chap. 46, Sec. 10.

No undertaker or other person shall bury or otherwise dispose of a human body in a town, or remove therefrom a human body which has not been buried, until he has received a permit from the board of health, or its agent appointed to issue such permits, or if there is no such board, from the clerk of the town where the person died; and no undertaker or other person shall exhume a human body and remove it from a town, from one cemetery to another, or from one grave or tomb other than the receiving tomb to another in the same cemetery, until he has received a permit from the board of health or its agent aforesaid or from the clerk of the town where the body is buried. No such permit shall be issued until there shall have been delivered to such board, agent or clerk, as the case may be, a satisfactory written statement containing the facts required by law to be returned and recorded, which shall be accompanied, in case of an original interment, by a satisfactory certificate of the attending physician, if any, as required by law, or in lieu thereof a certificate as hereinafter provided. If there is no attending physician, or if, for sufficient reasons, his certificate cannot be obtained early enough for the purpose, or is insufficient, a physician who is a member of the board of health, or employed by it or by the selectmen for the purpose, shall upon application make the certificate required of the attending physician. If death is caused by violence, the medical examiner shall make such certificate. If such a permit for the removal of a human body, not previously interred, from one town to another within the commonwealth cannot be obtained early enough for the purpose, the certificate of death made as above provided and in the possession of the undertaker desiring to make such removal shall constitute a permit for such removal; provided, that such body shall be returned to the town from which it was removed within thirty-six hours after such removal, unless a permit in the usual form for the removal of such body has been sooner obtained hereunder. If the death certificate contains a recital, as required by section ten of chapter forty-six, that the deceased served in the army, navy or marine corps of the United States in any war in which it has been engaged, such recital shall appear upon the permit. The board of health, or its agent, upon receipt of such statement and certificate, shall forthwith countersign it and transmit it to the clerk of the town for registration. The person to whom the permit is so given and the physician certifying the cause of death shall thereafter furnish for registration any other necessary information which can be obtained as to the deceased, or as to the manner or cause of the death, which the clerk or registrar may require.—Chap. 114, Sec. 45, G. L., (Tercentenary Edition).

Medical examiners shall make examination upon the view of the dead bodies of only such persons as are supposed to have died by violence. If a medical examiner has notice that there is within his county the body of such a person, he shall forthwith go to the place where the body lies and take charge of the same; . . . —General Laws, Chap. 38, Sec. 6.

No undertaker or other person shall bury a human body or the ashes thereof which have been brought into the commonwealth until he has received a permit so to do from the board of health or its agent appointed to issue such permits, or if there is no such board, from the clerk of the town where the body is to be buried or the funeral is to be held, or from a person appointed to have the care of the cemetery or burial ground in which the interment is made. . . . Chap. 114, Sec. 46, G. L., (Tercentenary Edition).

RULES OF PRACTICE

The fulfillment of the purpose of these laws calls for the observance of the following rules of practice:

(1) **Attending physicians** will certify to such deaths only as those of persons to whom they have given bedside care during a last illness from disease unrelated to any form of injury.

(2) **Board of Health physicians** will certify to such deaths only as those of persons who, though disabled by recognized disease unrelated to any form of injury, have died without recent medical attendance or whose physician is absent from home when the certificate of death is needed.

(3) **Medical Examiners** will investigate and certify to all deaths supposably due to injury. These include not only deaths caused directly or indirectly by traumatism (including resulting septicemia), and by the action of chemical (drugs or poisons), thermal, or electrical agents, and deaths following abortion, but also deaths from disease resulting from injury or infection related to occupation, the sudden deaths of persons not disabled by recognized disease, and those of persons found dead.

Statement of Cause of Death.—Cause of death means the disease, or complication which causes death, not the mode of dying, e. g., heart failure, asphyxia, asthenia, etc. As principal cause name the disease causing death. As related causes, name earlier morbid conditions, if any, related to the principal cause and any important complication of the principal cause.

Statement of Occupation.—Precise statement of occupation is very important, so that the relative healthfulness of various pursuits can be known. Make some entry in this section for every person aged 10 years or over. If the occupation had been given up or changed on account of the disease causing death, report the usual occupation prior to illness. If the deceased had retired from business, report the usual occupation prior to retirement. Children not gainfully employed may be returned as at school or at home. For a woman whose only occupation was that of home housework, write housework. For a person engaged in domestic service for wages, however, designate the occupation by the appropriate terms, as housekeeper—private family, cook—hotel, etc. For a person who had no occupation whatever write none.

SPACE FOR ADDITIONAL INFORMATION

DATE OF ENTERING MILITARY SERVICE _____

DATE OF DISCHARGE _____

RANK, RATING _____

ORGANIZATION AND OUTFIT _____

SERVICE NUMBER _____

D. IMPORTANCE TO THE MORTICIAN

The mortician is required by law to pursue a course of study and to be employed as an apprentice in order to perform a duty essential to the maintenance of public health. He is considered to be an agent of public health in his role as a sanitarian and in cases of emergency may be actually called upon to perform certain very necessary duties in order to safeguard the health of the community.

One of his routine tasks is to secure the standard certificate of death and fill in the place and date of burial. Death registration serves as evidence in the inheritance of property and in the settlement of property rights and of life insurance. It is useful in preventing crime through the restriction placed upon the disposal of dead human bodies, and insures a permanent and uniform record of the death of each individual for both sentimental and legal reasons.

Statistics of death are useful in showing the extent and rate of change in population produced by deaths, the average duration of life, the relative frequency with which the several causes produce death, and for their service in creating an interest in public health administration and securing support for sanitary measures.

E. UNIT SUMMARY

Questions for Review

1. What was the early Greek concept concerning the causes of disease?
2. Who is called the "Father of Bacteriology"?
3. List the contributions of Louis Pasteur.
4. What are Koch's "postulates"?
5. What three methods are commonly used to estimate population statistics?
6. Give the formula for crude Birth Rate.
7. Give the formula for specific Birth Rate.
8. Give the formula for Death Rate.
9. Give the formula for Morbidity Rate.
10. Of what importance is the death certificate to the mortician?

Suggested Projects

1. Obtain sample birth and death certificates from your local Board of Health and fill them out.
2. With data supplied by your local Board of Health, figure out the death rate of your community.
3. Find the specific death rate for:

   Typhoid
   Tuberculosis
   Scarlet Fever
   Whooping Cough

4. Make out a list of reasons why the mortician should have an elementary knowledge of vital statistics.
5. Find three practical examples, in any trade journal, where vital statistics have aided in the interpretation of data.

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II. ENVIRONMENTAL SANITATION

> "Thou shalt have a place also without the camp, whither thou shalt go forth abroad:"
> "And thou shalt have a paddle upon thy weapon; and it shall be, when thou wilt ease thyself abroad, thou shalt dig therewith, and shalt turn back and cover that which cometh from thee."
>
> Deuteronomy XXIII : 12, 13.

A. INTRODUCTION TO SANITATION OF THE ENVIRONMENT

Sanitary science is that part of public health which deals with the influence of environmental conditions upon the health and life of human beings. Every mortician in his capacity as a public health exponent should have a broad general knowledge of community sanitation and should possess specific knowledge of the details of those sanitary procedures that have a direct bearing on disease prevention. The dead human body is a potential source of contamination and hence it is a fundamental objective of any course in public health to place before the student of mortuary science those means and methods that are used in an effort to control the spreading of disease.

B. WATER SUPPLY

Water is essential to human life. It is a universal solvent and a cleaner, and is used widely in household and industrial processes. It is employed extensively in carrying off household and industrial waste and is a method of protection.

The embalmer is primarily interested in water supply because it may be an important factor in the transmission of disease. Water provides a means of transmitting bacterial diseases, such as typhoid, cholera, and dysentery, and of certain infections due to animal parasites. 1/ It is also responsible for a few non-infectious diseases, such as goiter, lead poisonings, and various gastro-intestinal irritation. Many etiological agents of disease survive for a long period of time in water, though they do not multiply and increase there. 2/ In the past widespread epidemics of disease due to pollution of water supplies were common. Sanitary methods have lessened the incident of water as a vehicle of disease transmission, but there still exists a potential danger of infected water supply and measures must be taken to prevent possible pollution from human sources.

1. Sources of Water. 3/

a. Distilled Water. Distilled water is the purest form of water. If the containers are clean bacterial content in the water is practically nil.

1/ Frobisher, M. Fundamentals of Bacteriology (Philadelphia, W. B. Saunders Co., 1944), pp. 441-442.

2/ Ibid., p. 440

3/ Gershenfeld, L. Bacteriology and Sanitary Science (Philadelphia, Lea and Febiger, 1933), pp. 429-432.

b. Rain Water. Rain water is the purest natural water available. The use of rain water for drinking purposes is not advised by sanitarians, due to the fact that it is not collected carefully and is usually stored in a manner which subjects it to impurities.

c. Ground Waters. This classification includes water taken from shallow or deep artesian wells or water flowing naturally from the ground:

A spring is a stream of water flowing naturally and is caused to emerge from the ground as a result of geological formation.

A well is a hole sunk into the earth to reach a supply of water and fitted with some mechanical device to bring this water to the surface.

A driven well is one made by driving a pointed iron pipe into a soil or sand or gravel, the water entering through perforations near the pointed end of the pipe.

A shallow well is merely a hole dug into the ground.

d. Surface Waters. Surface waters include all small streams, creeks, ponds, small and large lakes, reservoirs, and rivers which are all open and exposed.

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2. Sources of Pollution.[1]/ All surface waters are usually polluted while other supplies may be contaminated to a lesser extent. Bacteria and foreign chemicals may be washed into a water supply from the air, from living and dead bodies of plants and animals, and wastes from industrial plants. There is comparatively little danger from water containing products from the wastes of animal life, other than man. This is due to the fact that but few diseases of lower animals are transmissible to man.

Trade wastes mainly cause annoyance, either due to the fact that the process of purification of such contaminated water is made difficult or even impossible, so that the finished water to be supplied to the community may not possess an objectionable odor or taste. Trade-waste contaminations are individual problems which must frequently be handled separately, as each case may be a problem of its own.

From a sanitary viewpoint the greatest hazard is from a water polluted with wastes from the human body.[2]/ These discharges, especially urine and feces, may enter directly from privies, sewers, washing from the land and from all sources where this waste remains untreated.

1/ Jordan, E. O. and Burrows, W. Textbook of Bacteriology (Philadelphia, W. B. Saunders Co., 1946), pp. 219-220.

2/ Birkeland, J. Microbiology and Man. (Baltimore, Williams and Williams Co., 1948) p. 409.

3. Treatment of Water Supplies.[1] When water is found to be unfit for human consumption, ways and means of artificial purification must be employed. The following list includes acceptable methods for the purification of water:

a. Distillation. Is the best known method for rendering water pure from bacteriological and chemical standpoints. This method, however, is expensive and water so purified is not accepted for drinking purposes.

b. Boiling water. Is the safest method to destroy water-borne organisms. Boiling from 5 to 10 minutes is sufficient to destroy the pathogens of water-borne infection.

c. Filtration. This procedure is generally used as an initial method to purify large bodies of water.

d. Storage. Is a simple and satisfactory method of purifying water in large reservoirs. It is a natural method and purifies water by dilution, oxidation, sedimentation, and by sunlight.

e. Disinfection. Is practiced by individuals or small communities either alone, or in conjunction with storage where the supply is heavily laden with bacteria.

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[1] Frobisher, M. Fundamentals of Bacteriology (Philadelphia, W. B. Saunders Co., 1944), pp. 441-446.

The following disinfectants are commonly used:

(1) Ozone

(2) Chlorinated lime

(3) Liquid Chlorine

(4) Ammonia and bleaching powder.

4. Large Water Supplies.[1]/ Surface waters are generally employed for large communities. The procedure involves the adding of a coagulant and then allowing the mixture to settle in a tank for a period of from three to five hours. The coagulant produces a flocculant precipitate which deposits and carries along a considerable amount of the turbid and most of the coloring as well as the bacteria. The supernatant fluid is then passed through a slow and a mechanical sand filter and then chlorinated as an additional safety factor.

C. DISPOSAL OF WASTES

The general term waste is applied to all of the material which comprises:[2]/

1. Sewage (human excreta)

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[1]/ Gershenfeld, L. Bacteriology and Sanitary Science (Philadelphia, Lea and Febiger, 1933), pp. 434-435.

[2]/ Birkeland, J. Microbiology and Man (Baltimore, Williams and Williams Co., 1942), p. 424.

2. Refuse (applied to all solid wastes from human habitations not carried away by the sewers)

a. Garbage

b. Rubbish

c. Ashes

d. Street sweeping.

1. Sewage Disposal. The term sewage refers to the solid (sludge) and liquid (effluent) excreta of man.[1/] It also includes industrial waste, which, if allowed to deposit anywhere would become a menace to public health. The term sewerage refers to the "plumbing system" maintained to carry away excreta.

Human excreta, if not suitably cared for, may pollute drinking water and cause disease. Such diseases are infections of the intestinal tract, including the bacterial and virus diseases, such as typhoid fever, bacillary dysentery, and poliomyelitis, and also all the intestinal parasites. Many hookworm diseases, such as ascaris infection are also transmitted person to person because of imperfect methods of feces disposal.[2/] Thus it becomes apparent that great care

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1/ Ibid., p. 424.

2/ Bell, E. T. Textbook of Pathology (Philadelphia, Lea and Febiger, 1944), p. 227.

must be taken in formulating and effecting plans for the proper disposal of human wastes.

Nature has provided a very satisfactory system of safe excreta disposal in the nitrogen cycle, but this process takes time, requires space and in accompanied by very disagreeable odors.[1]/ Engineering science has devised very ingenious procedures to remove household and community wastes, and to enhance the processes of disintegration.

The essential problem in sewage disposal involves the reduction of offensive organic compounds to stable inorganic compounds and the elimination of possibly harmful bacteria. The general procedure involves the separation of sludge and effluent and the appropriate treatment of each. The following list represents several different methods that are applicable to the essential problem and are employed commercially in different communities:

a. Dilution Method.[2]/ This is the easiest method of disposal if the community is located near a large body of water. If such factors as sufficient dilution of water, satisfactory velocity of the current of water, and a sufficient amount of free

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[1]/ Smillie, W. G. Preventive Medicine and Public Health (New York, Macmillan Company. 1946), p. 100

[2]/Birkeland, J. Microbiology and Man (Baltimore, Williams and Wilkins Co., 1942). p. 429.

oxygen matter is present, are satisfied then the putrescible organic matter is oxidized by the oxygen into inorganic and inert material and the heavy particles will settle to the bottom. The bacteria are gradually destroyed by this process and the body of water by self-purification is free from pollution.

b. Artificial Methods. Where dilution is impossible there are several artificial methods of purification of sewage that may be resorted to:[1]/

(1) Combustion. Burning or heating to dryness. Method rarely used.

(2) Screening and Sedimentation. Sewage is screened to remove the coarse material. In some of the processes many different sizes of screens are employed, coarse to fine. The sewage is then allowed to flow slowly through basins where some of the suspended matter is deposited (sedimentation). There are five main types of sedimentation basins:

(a) Plain Settling Tanks. Plain settling basins at rate of two feet per sec. in which solids gradually subside to the bottom and are removed to prevent bacterial decompositions.

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[1]/ Ibid., p. 429.

(b) Grit Chambers. Small settling basins with the sewage passing through at the rate of slightly less than one foot per second remaining for a few minutes.

(c) Chemical Precipitation. Alum, ferrous sulphate and lime are added to hasten sedimentation. The chemicals produce a precipitate which settles to the bottom and carries down with it a considerable amount of suspended matter.

(d) Septic Tanks. Settling tanks which retain sewage for 8-24 hours. The sludge is decomposed by anaerobic bacteria and enzymes, from complex solid organic material into simpler substances.

(e) Digestion Tanks. The best known type is called the Imhoff or Emsher tank with the object of digesting the sludge alone in a separate compartment, so that the products of decomposition and gas are not allowed to mix with the floating sewage above. The sludge is separated into a separate compartment by falling through a slot in the settling tank.

The various septic tanks and digestion methods fail to remove all finely suspended matter and the effluent still contains a large amount of organic matter. The following methods are used for treating the effluent:[1]/

1. Sub-surface irrigation
2. Contact filters
3. Sprinkling filters
4. Intermittent sand filters
5. Activated sludge
6. Disinfection

2. Refuse Disposal. From a standpoint of sanitation of the environment, garbage is a nuisance because it forms a favorable breeding place for flies and other pests. The choice of disposal is strictly a matter of community choice.[2]/

a. May be fed to hogs and other animals
b. May be buried or dumped
c. May be mixed with rubbish and burned as a fuel
d. In large communities it may be dumped into the sea.
e. Reduction - garbage is cooked with steam under pressure and is then passed through presses, which separates the water and fats from the solid part.

1/ Gershenfeld, L. Bacteriology and Sanitary Science (Philadelphia, Lea and Febiger, 1933), pp. 425-428.

2/ Bolduan, C. F. and Bolduan, N. W. Public Health and Hygiene (Philadelphia, W. B. Saunders Co., 1942), p. 251.

The water and grease are passed through settling tank. The grease is then skimmed off the top, the water permitted to flow away to the under drain or evaporated, and solids are added to the tankage. The latter is treated with solvents to recover the grease.

f. Electric pig - a grinding attachment which is connected to a sink and the refuse is ground up and carried away by sewerage.

The disposal of all garbage and rubbish is not nearly as closely related to public health as is the disposal of sewage. To a large extent the disposal of refuse is a matter of civic housekeeping, but the disposal in large municipalities often presents difficult problems. Some communities strictly enforce a separation of garbage, ashes, and rubbish. Disposal by incineration is coming to be the most popular method.[1/]

Accumulations of refuse are objectionable from every angle; a menace to public health and a "sore-spot" of the entire community. The handling of all such wastes today depends not only upon a sanitary disposal of such waste, but attempts are made to obviate nuisances and to obtain a profitable recovery of products that have a commercial value.[2/]

[1/] Ibid., p. 251.

[2/] Ibid., p. 252.

D. VERMIN AND THEIR CONTROL

The term vermin is used in a limited sense to include noxious insects and small animals that are instrumental in the transmission of disease.[1] The most important small animals that transmit disease are domestic rats and mice.[2]

1. Rats and Rat Fleas. The control of disease spread by fleas rests primarily in the control of the rodent host. On board ship the use of hydrocyanic gas fumigation is used. The prevention of accumulation of garbage and eliminating food supply will control the rats and mice in urban areas.

2. Lice. The pediculus vestimenti is the most important transmitter of typhus. D. D. T. is a delousing agent that is extraordinarily effective against body lice. This drug is also effective against flies, roaches, mosquitoes, bedbugs, ants and many other insects.

3. Ticks. Man's chief defense is to wear protecting clothing in areas that are infested with ticks. Impregnation of clothing with dimethylphthalate should protect the individual against this pest.

4. Domestic Flies. Breed in horse manure and other similar collections of garbage and trash. The primary methods of control are to prevent the breeding of the insect.

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[1] Smillie, W. G. Preventive Medicine and Public Health (New York, Macmillan Company, 1946), p. 107.

[2] Ibid., pp. 108-110.

Fly trapping, chemical destruction of fly larvae, poisoning are of secondary value.

5. Mosquitoes.[1] The control of diseases spread by mosquitoes requires an intimate knowledge of the specific offending mosquito. Several important methods devised to control the breeding places of the anopheles larvae are:

a. Drainage of the area by ditching

b. Filling and leveling the area

c. Vertical draining

d. Clearing the water surface of all debris

e. Changing the water level rapidly at weekly intervals

f. Utilization of Gamnusia Affinis, a minnow that is the natural foe of mosquito larvae

g. Spraying the water with oil, arsenic dust, and other larvacides.

Disease Transmission by Insects.[2]

1. Malaria Fever

a. Cause - Plasmodium vivax; P. malariae; P. falciparum

b. Carrier - Anapheles mosquito

c. Life cycle of Plasmodium

d. Normal host - man.

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[1] Gage, N. D. and Landon, J. F. Communicable Diseases (Philadelphia, F. A. Davis Co., 1944), p. 310.

[2] Smillie, W. G. Preventive Medicine and Public Health (New York, Macmillan Company, 1946), p. 120.

2. Yellow Fever
   a. Cause - Filtrable virus
   b. Carrier - Aedes mosquito and others
   c. Normal host - man
3. Dengue
   a. Cause - Filtrable virus
   b. Carrier - Aedes mosquito
   c. Normal host - man
4. Plague (bubonic and pneumonic)
   a. Cause - bacillus pestis
   b. Carrier - the rat flea
   c. Normal host - the rat and sometimes squirrels
   d. Transmission of pneumonic plague
5. Typhus Fever
   a. Cause - Rickettsia prewazeki
   b. Carrier - human body louse and head louse; also from rat by the rat flea; other insects may be involved.
   c. Normal host - man, rats and mice.
6. Rocky Mountain Spotted Fever
   a. Cause - Dermacentroxenus rickettsi
   b. Carrier - various ticks
   c. Normal host - rabbits, squirrels, and possibly other animals.
7. Trench Fever
   a. Cause - Rickettsia quintana

b. Carrier - louse

c. Normal host - man

8. Relapsing Fever

a. Cause - Spironema recurrentis (Obermeier's spirichete)

b. Carrier - louse, bedbug and ticks

c. Normal host - Man and various animals, particularly rodents.

9. African Sleeping Sickness

a. Cause - Trypanosoma gambiense

b. Carrier - Tse-tse fly

c. Normal host - man.

10. Tularemia

a. Cause - Bacillus tularense

b. Carrier - Deer fly to man from animals; by lice and ticks among rodents

c. Normal host - Various rodents such as squirrels, rabbits, etc.

d. Transmission is very common through handling of infected animals.

F. FOOD INSPECTION

Supervision of the character and quality of food supplies and conditions under which foods are produced, handled and sold is a public health function.[1/]

[1/] Smillie, W. G. Preventive Medicine and Public Health (New York, Macmillan Company, 1946), p. 120.

1. Meat Inspection. The inspection of meat at slaughter houses by trained inspectors is a necessary measure for the protection of the public health. About two thirds of the meat consumed in the U. S. passes federal inspection.[1] The inspection includes the processing of meat and fish and covers all operations such as canning, smoking, cooking, and curing. All products accepted are marked "U. S. inspected and passed."

Strict regulations concerning the prevention of contamination of oyster beds and the sanitary packing and shipping of oysters and other shell fish are enforced, and a system of identification of each shell fish shipment, is instituted.[2] Federal inspection is supplemented locally by community and state Departments of Health.

2. Preservation of Food. The principles of good food preservation are very simple.

They depend upon the following facts:[3]

a. Food spoilage is due largely to bacterial action. Hence, bacterial control results in food preservation.

1/ Ibid., p. 120.

2/ Ibid., p. 121.

3/ Carter, C. F. Microbiology and Pathology (St. Louis, C. V. Mosby Co., 1944), p. 79.

b. Bacteria require certain conditions for development. Among these we find:

(1) Sufficient food of the proper kind must be present.

(2) Moisture must be available.

(3) The temperature must be suitable for the species.

(4) The proper degree of alkalinity or acidity must be present.

(5) The oxygen requirements for the species must be met.

(6) There must not be too great an accumulation of the products of bacterial growth.

(7) Light must be partially or completely excluded.

Any great departure from any of these requirements will greatly modify bacterial growth. Thus food preservation, developed for centuries on an empirical basis, now has become an exact science, based on the study of Bacteriology. The following methods are commonly used to preserve food:[1]/

(1) Refrigeration
(2) Canning
(3) Salting
(4) Drying
(5) Corning
(6) Pickling
(7) Cooking
(8) Smoking
(9) Chemicals
(10) Preservatives

1/ Smillie, W. G. Preventive Medicine and Public Health (New York, Macmillan Co., 1946), pp. 121-122.

3. Handling of Food. The principles of proper food handling resolve themselves into simple common-sense practices. Food handlers should be inspected periodically and in themselves strictly adhere to sound sanitary principles. Eating and drinking utensils should be sterilized by accepted bacteriologic methods. Hot water and soap, with a steam rinse, is a satisfactory method of cleaning dishes. Modern methods include the utilization of the bactericidal effect of Ultra-Violet Rays.

Important minimal features of a sanitary inspection include:[1]

a. Insistence upon cleanliness, with ample facilities for obtaining plenty of soap and hot water.

b. Provision of ample toilet facilities for employees away from the kitchen, with insistence that the hands shall always be washed after each visit.

c. Ample provision for proper refrigeration and storage of foods, with no possible access of rats or other vermin to the food.

d. Regular impartial inspection by a well-trained sanitary inspector, who must realize that his chief function is educational, with recourse to police powers only as a last resort.

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[1] Bolduan, C. F. and Bolduan, N. W. Public Health and Hygiene (Philadelphia, W. B. Saunders Co., 1942), p. 265.

The chief menace is the actual contamination of food by the food handler who is a carrier of disease.[1]/

G. SANITATION OF MILK

Milk fresh from the mammary glands of healthy cows is free from bacteria.[2]/ However, this well-balanced food not only furnishes an ideal diet for man, but also affords a very suitable agency for the growth of both pathogenic and non-pathogenic bacteria which are able to contaminate the milk from a wide variety of sources. In recent years, health officials have aroused public opinion to the need for sanitary supervision in the production of market milk.

The chief sources of bacteria contamination of market milk are:[3]/

1. Diseased Cattle. Cows infected with tuberculosis or with streptococcus infection of the udder. Cows so infected can be detected by the dairyman and should be segregated from healthy cattle.

2. Milkers. Should be instructed to observe personal cleanliness.

3. Environmental Sources. These are many and diversified; including dirty cattle, improper drainage, lack of

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1/ Ibid., p. 265.

2/ Salle, A. J. Fundamental Principles of Bacteriology (New York, McGraw-Hill Book Co., 1943), p. 438.

3/ Smillie, W. G. Preventive Medicine and Public Health (New York, Macmillan Co., 1946), p. 129.

screening, flies, dust, and milking utensils. (Pails, churns, filters, pipes, etc.)

The diseases most commonly spread by milk include bacillary dysentery, typhoid fever, scarlet fever, infantile diarrhea, septic sore throat, undulant fever, and bovine tuberculosis.[1] At the present time milk-borne epidemics of typhoid fever are more common than water-borne ones.

The Agar Plate method is in use universally for estimating the bacterial content of milk.[2] Samples of milk taken from the dairy will give an index to the claims of the dairy by the determination of the number of bacteria in milk.

Pasteurization of milk is another practical measure which has been enacted in most communities. This process will destroy all the non-spore-bearing bacteria, both pathogenic and non-pathogenic. The milk is heated to a temperature of from 60° to 68° C. with an exposure of at least 20 minutes.[3]

The milk must be constantly stirred during the process and should be transferred through pipes, where it is chilled, to the bottling machines. Pasteurization is not

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[1] Frobisher, M. Fundamentals of Bacteriology (Philadelphia, W. B. Saunders Co., 1944), p. 568.

[2] Salle, A. J. Fundamental Principles of Bacteriology (New York, McGraw-Hill Book Co., 1943), p. 441.

[3] Carter, C. F. Microbiology and Pathology (St. Louis, C. V. Mosby Co., 1944), p. 240.

sterilization; is not a remedy for unsanitary procedures.

The grading of milk is based upon quality and bacterial count and differs widely among the several States. The system offered by the American Public Health Association is as follows:[1]/

Grade A (Raw). Cows should be free from disease and the bacterial count should not exceed 10,000 per C.C.

Grade A (Pasteurized). Cows should be free from disease and milk must be handled in such a way that the count does not exceed 200,000 per C.C. before pasteurization or 10,000 living bacteria after pasteurization.

Grade B (Pasteurized). Cows should be free from disease and the bacterial count should not exceed 1,000,000 per C.C. before pasteurization or 50,000 living bacteria when delivered. This milk is used for manufacturing and cooking.

Certified Milk. A term applied to milk produced under ideal conditions, under the specifications of the American Association of Medical Milk commissions. The milk under these conditions is necessarily expensive.

H. SANITARY NUISANCES

A nuisance by definition is any act which endangers life or health, gives offense to the senses, violates

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1/ Salle, A. J. Fundamental Principles of Bacteriology (New York, McGraw-Hill Book Co., 1943), p. 443.

decency, or obstructs the reasonable and comfortable use of another's property.[1]/ By early statutes Boards of Health were given jurisdiction over nuisances and this early function has been retained until the present day.[2]/ The handling of nuisances by the sanitarian is a most trying problem for it necessitates considerable expenditure of time and often leads to ill will.

Nuisances are classified into two general categories.[3]/

1. Public--When there is injury to the community in general.
2. Private--When the rights of a few persons are involved.

The following table will illustrate the types of nuisance that are most typical in affecting the public health of a community:

1. Advertisements
2. Bakeries
3. Barking of dogs
4. Barns
5. Beer
6. Bells
7. Bituminous Coal
8. Blacksmith shops
9. Blast furnace
10. Blasting
11. Bowling Alleys
12. Bridges
13. Carcases of dead animals
14. Carpet cleaning

1/ Belding, D. L. Public Health and Preventive Medicine (Boston, D. L. Belding, 1936), p. 54.

2/ Ibid., p. 54.

3/ Ibid., p. 54.

15. Cattle pens
16. Cement works
17. Cesspools
18. Coalyards
19. Contagious diseases
20. Dairies
21. Dams
22. Excavations
23. Explosions
24. Factories
25. Fair
26. Fertilizer
27. Fire engines
28. Garbage plants
29. Laundries
30. Livery stables
31. Machinery
32. Marble works
33. Oil wells
34. Overflow of water
35. Overhanging structure
36. Pollution of water
37. Ponds
38. Prize fights
39. Pumping stations
40. Railroads
41. Saloons
42. Sewers
43. Slaughter houses
44. Smelting works
45. Water closets
46. Wells
47. Wharves
48. Whistles
49. Wrecks
50. Wind

H. STERILIZATION AND DISINFECTION

The ability to render safe the various things about us which have been contaminated by germs is an art of the utmost consequence to the profession of Mortuary Science and to all others responsible for public health.

Of the many things which the student of Embalming must learn, none is so important as the fundamental principles

of sterilization and disinfection by which he sterilizes his instruments and apparatus and by which he makes safe the various contaminated articles which he must use. Slips in sterilizing or in disinfecting are not only hazardous, but they may jeapordize the accuracy and usefulness of every procedure that may be attempted.

There are three main purposes for killing or removing bacteria:[1]/

1. To prevent infection of man, animal and plants.

2. To prevent spoilage of food and other commodities.

3. To study the growth of one kind of organism in a particular medium or in an infected animal and not be confused by the presence and growth of others at the same time.

There are many substances and procedures involved in accomplishing these results:[2]/

1. Sterilization. A process whereby all life within certain confines is destroyed. It is an absolute term and may be accomplished by heat, chemicals, x-rays, etc.

2. Disinfection. A process whereby all the germs capable of producing disease are destroyed . Not all organisms are killed by disinfection, however many processes of disinfection accomplish sterilization.

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[1]/ Rice, T. B. Textbook of bacteriology (Philadelphia, W. B. Saunders Co., 1942), p. 67.

[2]/ Ibid., pp. 67-68.

3. Disinfectant. A chemical agent that accomplishes disinfection.

4. Bactericide. An agent which kills bacteria.

5. Germicide. A chemical substance which kills germs.

6. Antisepsis. A condition in which growth and development of bacteria is inhibited. The germs are not necessarily killed but retarded in growth and activity.

7. Antiseptic. A chemical substance which has the power of inhibiting bacterial growth. Most disinfectants are antiseptics when used in high dilution and most antiseptics are disinfectants when used in concentrated form.

8. Asepsis. A condition in which germs are prevented from contaminating an object.

9. Fumigation. A process whereby a room or an enclosed space is subjected to the action of gases or fumes.

10. Deodorant. A substance which destroys, absorbs, neutralizes, disguises, or otherwise counteracts a noxious odor.

11. Insecticide. A preparation that kills insects.

1. Methods of Sterilization and Disinfection

Sterilization may be accomplished by three general methods: mechanical, physical, and chemical.[1]/

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[1]/ Carter, C. F. Microbiology and Pathology (St. Louis, C. V. Mosby Co. 1944), p. 131.

a. Mechanical Methods: There are three chief mechanical methods of removing or destroying bacteria.[1]/

(1) Scrubbing, Usually accomplished by water to which some chemical, such as soap or sodium carbonate has been added. This process may be described as both mechanical and chemical.

(2) Filtration. The process of removing bacteria by passing liquids through a material which holds back the bacteria. This process is used in the laboratory and is often utilized in purifying a city's water supply.

(3) Sedimentation. The process by which suspended particles settle to the bottom of a liquid. The process is often accelerated by adding a coagulant.

b. Physical Methods: The most applicable physical method of sterilization is by means of heat. The temperature that kills a liquid culture of some certain species in 10 minutes is called the Thermal Death Point.[2]/ Heat may be applied in several different ways.[3]/

(1) Burning. Contaminating articles of little value

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[1]/ Ibid., p. 131.

[2]/ Carter, C. F. Microbiology and Pathology (St.Louis C. V. Mosby Co., 1944), p. 133.

[3]/ Ibid., p. 133.

are best destroyed by this means. Used in cremation.

(2) Dry Heat. Is used in oven sterilization. Articles in ovens are very dry and in order to be freed of spores must reach a temperature of 165° to 170° C. for a period of 2 to 3 hours. Only dry articles not injured by baking may be thus sterilized.

(3) Moist Heat. Superior to dry heat in penetrating power. There are several methods of applying moist heat:[1]

(a) Boiling. Kills all vegetative bacteria in 5 minutes. Boiling for 1 or 2 hours kills most spores.

(b) Free-Flowing Steam. Has about the same sterilization power as boiling water. Principles used by the Arnold Sterilizer.

(c) Steam under Pressure. The most effective method of using heat. The higher the pressure the higher the temperature. Principle utilized by the Autoclave.

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[1] Ibid., p. 134.

(d) Fractional Sterilization. Use of temperature below the boiling point. Useful in the sterilization of culture media.

c. Chemical Methods: It is essential that the embalmer of today knows the qualities of a good disinfectant because there are literally hundreds of chemical substances that are available. Some of the factors which should be considered are:[1]/

1. Suitability
2. Cost
3. Availability
4. Convenience
5. Danger
6. Damage

There are 4 general factors which will influence the action of the specific disinfectant used:[2]/

1. The qualities of the disinfectant
2. The nature of the material to be disinfected.
3. The concentration of the disinfectant.
4. The matter of application.

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[1]/ Carter, op. cit., p. 140.

[2]/ Carter, op. cit., p. 141.

2. Standardization

The phenol coefficient of chemical is a term applied to the comparison with that of phenol (carbolic acid) under identical acting conditions.[1]/ If a disinfectant has a coefficient greater than 1, it is a stronger disinfectant than phenol, and if it has a coefficient less than 1, it is a weaker disinfectant than phenol.

The comparison is made at different concentrations actions for a specific period of time at designated temperatures on some specific organism. The determination of phenol coefficients requires a high degree of skill and the result has very definite limitations.

3. Classification

Disinfectants other than strong acids and alkalies are divided into several groups:[2]/

1. Salts of heavy metals
2. Oxidizing agents
3. Halogens
4. Carbon compounds.
5. Organic dyes.

There are hundreds of good reliable disinfectants and

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[1]/ Carter, C. F. Microbiology and Pathology. (St. Louis, C. V. Mosby Co., 1949), p. 142.

[2]/ Ibid., p. 142.

antiseptics on the market today. The following table will summarize in a tabular form some of the characteristics of the more important and most commonly used disinfectants.

4. TABLE OF DISINFECTANTS[1]/

DISINFECTANTS	CHARACTERISTICS	USE
I. Salts of Heavy Metals Bichloride of Mercury	Odorless, poisonous, white powder. Irritating to skin, corrodes metals	Disinfectant for hands, glass and rubber
Silver nitrate	½ the germicide action of bichloride of mercury, action checked by use of sodium chloride, soluble in water	Highly toxic to Gonococci. Used in prophylaxis and treatment of gonorrhea
II. Oxidizing Agents Hydrogen Peroxide	Not stable, bleaches certain organic color, quickly reduced by blood, pus and mucus	Cleaning of dirty wounds, removing crusts and softening bandages
Potassium permanganate	Strong oxidizing qualities, weakened by presence of organic matter	Treatment of infections of the genito-urinary tract.
III. Halogens Chlorine liquid	Active chemically, irritating to tissues	Sterilization of drinking water, purification of swimming pools, treatment of sewage, disinfection of wounds.

1/ Carter, op. cit., pp. 143-149.

DISINFECTANTS	CHARACTERISTICS	USE
Hydrochlorides (chlorine of lime bleaching powder) Calcium hydrochlorite	Bleaches and destroys fabrics when exposed to air; cheap and effective when properly used	Best means for disinfecting excreta. Destroys germs and breeding places of germs because of its oxidizing powers
Tincture of Iodine	Too strong or very old solution will burn skin	Best known for skin cuts and wounds.
IV. Carbon compounds Alcohol	Acts by coagulation	Excellent for cleaning skin after operations; effective as germicide antiseptic, and preservative.
Formalin	Gives off formaldehyde and is irritating to eyes. If kept stoppled will keep indefinitely; when fresh it is clear after standing a while precipitate appears.	Value as disinfectant great and is used as a preservative for animal tissue.
Lysol	Well known odor; solutions should be made with soft or distilled water	Good disinfectant but dangerous when improperly applied.
Phenol (Carbolic acid)	Corrosive poison. Soluble in water, alcohol and oil; has characteristic odors. Should not touch the skin	Excellent for feces blood, pus, sputum. Good skin anesthetic; stops itching and pain.
Tricresol	Higher germicidal power than phenol, less poisonous	Good disinfectant for feces and sputum
Bard-Parker	Cannot be used for lacquered instruments	Excellent for sterilizing fine instruments

V.

DISINFECTANTS	CHARACTERISTICS	USE
V. Organic Dyes Mercurochrome	Derivative of cosin; relatively weak	Valuable in treating fresh wounds.
Sulfonamide Compounds	Hold germs in check while immunological resources of body get rid of them	Moderately active germicides.

5. Antiseptics. It has been stated that an antiseptic is a chemical substance which has the power to inhibit bacterial growth, hence any dilute disinfectant may act as a disinfectant.

Some of the more commonly used and reliable antiseptics are:

a. Boric acid
b. Hydrogen peroxide
c. Sodium perborate
d. Mercurochrome
e. Salt
f. Iodoform
g. Chloroform
h. Dyes

6. Deodorants. By definition a deodorant is any substance which will destroy, absorb, neutralize, disguise, or otherwise counteract an obnoxious odor.[1]/

Obnoxious odors are derived from either organic or inorganic substance.[2]/ The odor may originate from garbage,

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1/ Rice, T. B. Textbook of Bacteriology (Philadelphia, W. B. Saunders Co., 1942), p. 68.

2/ Ibid., p. 68.

sewage, or reducing plants, or may arise from a high concentration of sulphur dioxide.

Objectionable odors are definitely a sanitary nuisance and may indicate a site of disease. The methods used to combat unpleasant odors are complex in their application, for a deodorant itself may result in something obnoxious to the sense of smell. The following list is suggestive of materials that can be used for deodorization.[1]/

a. Essential Oils. Oil or eucalyptol used for deodorizing stools.

b. Chlorine. Odors in water and sewage.

c. Ferrous sulfate. Cesspools, sinks, water-closets

d. Lime. Barns, latrines.

e. Milk of Lime. Stools and sputum.

f. Hydrogen Peroxide. Ulcers, breath.

g. Formaldehyde. Organic matter.

h. Potassium permanganate. Weak odors in the air.

7. Fumigation. Fumigation is essentially the process of ridding the environment free of bacteria and vermin by means of a smoke, gas, or vapor.[2]/ There are several general principles that must be carried out before the actual process of gaseous disinfection is carried out.[3]/

1/ Gershenfeld, L. Bacteriology and Sanitary Science (Philadelphia, Lea and Febiger, 1933), p. 132.

2/ Ibid, p. 132.

3/ Ibid, pp. 133-138.

a. Quantities of material to be used and generally recorded in amounts required per 1000 cubic feet. It is therefore essential to determine the cubic space of the area to be fumigated.

b. All openings in the enclosure should be rightly sealed.

c. All closets, drawers, bookcases, etc., should be opened.

d. Select a proper vessel in which the gas is to be generated. It is also advisable to place the vessel on bricks.

e. Allow a clear passageway to the door and to the window which are to be opened when fumigation is completed.

f. Fumigants should be allowed to act at least 6 to 10 hours.

The following fumigants are considered to be the best that are available for practical gaseous disinfection:1/

a. Formaldehyde. The best known bacterial fumigant. It is useless for destruction of flies, fleas, and mosquitoes, for it is not an insecticide.

(1) Concentration. 10-12 oz of formalin per cu. ft.

(2) Moisture. Room should be saturated.

(3) Temperature. Room temperature is adequate.

1/ Gershenfeld, op. cit., pp. 133-138.

(4) Duration of Exposure. 5 hours considered minimum.

(5) Methods of Liberation:

(a) Sheets saturated with formalin.

(b) Boiling of formalin.

(c) Burning paraform candles.

(d) Chemical reaction between formalin and potassium permanganate.

b. Sulfur Dioxide. Will not kill spore-bearing organisms and does not possess deep penetrative properties. It is useful as a germicide. It is injurious to most plants, so it cannot be used to destroy plant insects. It is not practical for use in the household and its use as a disinfectant is limited to empty buildings and environment where equipment will not be injured.

c. Hydrocyanic Acid. Has little or no bactericidal efficiency. It is the best insecticidal fumigant available and is highly poisonous to man and should never be employed where humans may be found.

(1) Concentration. 4.5 oz. K C N per 1000 cubic feet.

(2) Room must be tightly sealed.

(3) Gas is generated by action of dilute sulphonic acid on sodium or potassium cyanide.

(4) Duration of Exposure. Depends on depth of cargo.

d. Pyrethrum. Effective as an insecticide.

e. Carbon Disulphide. Effective as an insecticide.

f. Ethylene Oxide. Effective as an insecticide.

I. PRACTICAL CONSIDERATIONS FOR THE MORTICIAN.

This unit on sanitation of the environment has a very practical significance for the embalmer and for the funeral director, because sanitary science by definition is that part of public health which deals with the influence of environmental conditions upon the health and life of human beings. Every mortician as an agent of public health should have broad understandings of the entire field, plus certain detailed knowledge of those specific sanitary procedures that have a direct bearing on disease prevention.

Water supply is studied by the mortician because it may be an important factor in the transmission of disease. He is interested in the incident of water-borne diseases in a professional sense and is careful via proper sanitary procedures not to be a contributing factor in the spreading of such disease. In the event of serious epidemic he may be called upon to assume specific duties as a sanitarian.

The subject of disposal of wastes has a practical application for the mortician. Every preparation room must be provided with proper and convenient receptacles for all

waste materials. And all materials should be destroyed by incineration at the conclusion of each case. These receptacles should remain free from accumulations of any sort and should be deodorized after use. Disposal of waste becomes an important item in the protection of public health by the mortician.

Vermin are small animals that transmit disease. The funeral home and particularly the preparation room must be adequately screened and protected so that all forms of vermin are not permitted to enter.

It is interesting to observe that the rules and regulations of some states prohibit the funeral director from handling or serving food or liquids in connection with any funeral.

A funeral home could be considered to be a sanitary nuisance along with hospitals and clinics if it in any way endangers life or health, gives offence to the senses, violates decency or obstructs the reasonable and comfortable use of another's property. However, according to the rules and regulations of the Boards of Regulations of Embalming and Funeral Directing this item is completely eliminated. Specific regulations and laws govern practically every aspect of the mortician in his contact with public health.

Of the many topics which the student of Mortuary Science must be familiar, none is quite so important as the

fundamental principle of sterilization and disinfection by which he sterilizes his instruments and equipment and renders safe the various contaminated articles which he may use. Sterilization and disinfection have previously been treated in a very generalized way. The following discussion will formulate in a very specific way the type of practical consideration that is absolutely essential for the embalmer.

APPLIED ENVIRONMENTAL SANITATION

1. The Mortician. Both embalmers and funeral directors must be especially fastidious in their own personal hygiene, lest they in some manner spread germs by contact with contaminated substances; HANDS, SKIN, NAILS, TEETH, in fact everything in the environment must be treated with extreme care to the end that individual resistance to disease may be kept at a high level and the health of the public maintained.

2. Hands. Unless proper disinfection is carried out the hands of the embalmer are most surely agents for the transmission of infection to themselves and to others. Scrubbing the hands with a germicidal soap and hot water is practical, necessary and may be sufficient. After scrubbing, the hands should be rinsed and dried. This should be followed by rinsing in alcohol or by immersion in a 2½% phenol solution. The nails must be treated with extreme care, for simply dipping in an antiseptic is of little value. The immediate use of a good hand lotion

will prevent the hands from becoming chapped.

3. Rubber Gloves. After the embalming operation is completed the operator should wash his gloves in cold water before removing them. They then should be washed thoroughly inside and outside with green soap or bichloride of mercury and then autoclaved for 15 minutes. Boiling for 5 minutes may be accomplished if an autoclave is not available.

4. Rubber Tubing, and Sheeting. Rubber tubing may be immersed in a 2% solution of household lye and then boiled for an hour or may be autoclaved. Sheeting should be washed in hot water with plenty of soap, immersed in bichloride of mercury for at least one hour and then washed in cold water.

5. Instruments. Non-cutting instruments may be sterilized by autoclaving for 30 minutes. Cutting instruments should be submerged in a 1:1,000 metapher or in 90% alcohol for 20 minutes. Needles may be sterilized by autoclaving, boiling, or dry heat. Hypodermic syringes may be autoclaved or boiled for 5 minutes.

6. Body Discharges. Feces and urine should be mixed with 5% carbolic acid solutiom or pure milk of lime. There must be complete immersion and should stand for one hour. Sputum and saliva should be received in cotton or in paper cups containing 5% phenol and burned. Aspirated blood should be treated in 5% phenol, mixed well and then should stand for at least an hour before disposal.

7. Clothing, Towels, Bed Linen. All clothing that has come in contact with the deceased during his last illness, should be considered as contaminated and hence exposed to steam before washing. Mattresses and blankets may be sterilized in special chambers. It is absolutely essential that the embalmer wear a clean sanitary gown during the embalming operation. After each operation the gown must be laundered or in case of contamination should be sterilized.

8. Terminal Disinfection. Is the final disinfection of a room and its contents after it has been vacated. Gaseous disinfection may be required and then supplemented by airing and sunlight. Woodwork, walls and floors may be washed with soap solution followed by a suitable disinfectant, such as 1:1,000 mercurio chloride. Terminal disinfection may under certain circumstances become the function of the embalmer and he must be prepared to meet this eventuality.

9. Rreparation Room.[1]/ Ideal sanitary prerequisites for the embalming or preparation room include some of the following items:

a. The room should be private and so labeled and in some secluded ,preferably isolated, section of the establishment. All windows should be constructed with translucent glass to assure privacy of operation.

1/ Rules, Regulations and Laws. Commonwealth of Mass. Board of Registration in Embalming and Funeral Directing, pp. 10-11.

b. All rules and regulations of sterilization and disinfection should be faithfully observed and practiced. An embalming room of this type is ready for any inspection, either by members of State examining boards or by clientele.

c. The room should be of such construction as to facilitate the embalming operation with adequate heating, lighting, and ventilation. The use of ultra-violet light affords an extra margin of precaution. Floors should be of such material as to be rendered waterproof.

d. Plumbing facilities must be periodically checked and minimum requirements include a slop sink with a 3 inch drain.

e. The room must be adequately screened and protected against all form of vermin.

f. All equipment, including instruments, receptacles, sanitary gowns and towels, and apparatus of various kinds, must be cared for according to the specific rules and regulations as mentioned in the previous section.

J. UNIT SUMMARY

Questions for Review

1. Name 4 sources of water supply.

2. Give 5 acceptable methods for purifying water supply. Be able to explain each.

3. Differentiate between sludge and effluent, sewage and sewerage.

4. Name 6 choices of refuse disposal.

5. Name 5 diseases transmissible by insects. Give the cause, carrier and host.

6. Name several minimal features of a sanitary inspection.

7. What are the chief sources of bacterial contamination of market milk?

8. What is pasteurization?

9. List several sanitary nuisances.

10. Define the following: Sterilization, Disinfection, Germicide, Antiseptis, Fumigation, Deodorant, Insecticide.

11. Explain the three general methods of sterilization.

12. What is meant by phenol coefficient?

13. How are disinfectants classified?

14. Give 2 examples of disinfectants from each class and explain their practical use.

15. Discuss the ideal sanitary requisites for a preparation room.

Suggested Projects

1. Make a visit to your local water purification plant, sewage disposal plant, and note all procedures.

2. Visit a milk producing plant and observe all procedures.

3. Make a list of all sanitary nuisances observable in your community.

4. What means and methods are employed by your community in disposal of waste?

5. Plan a field trip to the State Department of Public Health.

6. Obtain literature from your local Board of Health regarding all phases of sanitation of the environment.

7. Prepare a chart or a blueprint of an ideal preparation room based on the Rules, Regulations and Laws as published by the Board of Registration in embalming and funeral directing, as the minimum in guiding principles.

8. Collect data relative to a sanitary survey of your own community.

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III. CONTROL OF COMMUNICABLE DISEASE

> "The extent to which epidemic, endemic, or contagious diseases prevail is the great index of Public Health. When the proportion is comparatively smal, the condition of the Public Health is favorable; when large it is unfavorable. If as a class, these diseases are found to decrease, it must be inferred that the general health of the people is improving."
>
> Lemuel Shattuck

A. GENERAL PRINCIPLES AND METHODS OF TRANSMISSION

In order to gain a working knowledge of communicable diseases, it is essential that certain general principles be thoroughly understood by the mortician. Common usage has made the term contagious disease and communicable disease practically synonymous. However, in a strict sense the term "contagious" is applied to those diseases that are spread from person to person and the term "communicable" is applied to those diseases whose causative agent is directly or indirectly transmitted from host to host.[1]/

1. Causes of Disease. One of the important differences between diseases is the variety of agents responsible. Some of the main classes of causative organisms are:[2]/

1/ Landon, J. F. and Gage, N. D. Communicable Diseases. (Philadelphia, G.A. Davis Co., 1944), p. 3.

2/ Feemster, R. F. "Control of Communicable Diseases," Communicable Diseases (Boston, Commonwealth of Mass., 1939). p. 4.

a. Bacteria. Small living plant cells of various shapes, called cocci, bacilli, and vibrios.

b. Yeasts. Larger vegetable cells similar to the familiar variety used in making bread.

c. Molds. More complicated vegetable structures similar to the household mold.

d. Viruses. Ultra-miroscopic living agents.

e. Spirochetes. Spiral organisms; usually classified as small plants.

f. Protozoa. Small unicellular animals.

g. Helminths. Members of the worm family, such as hookworms and tapeworms.

2. Methods of Transmission. The ability of micro-organisms to invade the body and cause infection depends upon two general factors: Virulence of the invader and resistance of the host.[1]/ The inter-relationship of these two factors determines whether the individual will acquire the disease or not.

Bacteria gain entrance to the body by several portals of entry.[2]/

a. Digestive Tract. Food and drink are general

1/ Jordan E. O. and Burrows, W. Textbook of Bacteriology (Philadelphia, W. B. Saunders Co., 1946), p. 198

2/ Carter, C. F. Microbiology and Pathology (St. Louis, C. V. Mosby Co., 1944), p. 175.

vehicles for entry of pathogenic organisms into the body. Typhoid and dysentery bacilli, cholera spirilla, and amoebas of dysentery are typical organisms.

b. Skin. Some fungi penetrate the hair follicles and cause disease. Broken skin offers an easy admission for pathogenic organisms.

c. Respiratory Tract. Pneumonia and pulmonary tuberculosis are by this avenue. German measles gain entrance by this method.

d. Genito-urinary System. Such agents as these which cause venereal disease are examples of this type.

Pathogenic bacteria have very definite avenues of discharge from the body.[1]/

1. Feces. Organisms of typhoid fever, bacillary and amebic dysentery, cholera and tuberculosis.

2. Urine. Organisms of typhoid fever, paratyphoid fever, and undulant fever.

3. Discharges from Respiratory Passages. Whooping cough, pneumonia, influenza, scarlet fever, meningitis.

4. Saliva. Rabies.

5. Blood. Organisms of malaria tularemia, virus of yellow fever, and Rocky Mountain spotted fever.

1/ Carter, op. cit., pp. 178-180.

There are several modes of spreading of communicable diseases.[1]/

a. By Inanimate Objects. Dishes, food, milk, and water which such diseases as typhoid fever, paratyphoid fever, cholera, are carried.

b. By direct Contact. Most diseases of this group are acquired by breathing the organism into the nose, throat, or lungs. These include smallpox, measles, influenza, and chicken pox. Others in this group include syphilis and gonorrhea.

c. By Prolonged Contact. Leprosy, trachoma, and tuberculosis are rarely transferred except after living in a household with the infected person for a considerable length of time.

d. By Insects. (See Vermin.)

e. From Animals. Rabies, trichilosis and tularemia are diseases which man acquires from an infected animal.

B. CLASSIFICATION OF COMMUNICABLE DISEASES

At the present time there is no one suitable classification of communicable diseases. The following classification

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[1]/ Feemster, R. F. "Control of Communicable Diseases," Communicable Diseases (Boston, Commonwealth of Mass. Dept. of Public Health), p. 5.

is based on the Portal of Entry:[1]/

Group I. Upper Respiratory System

Measles

Chicken Pox

Mumps

Pertussis

Scarlet Fever

Diphtheria

Poliomyelitis

Meningococcic Infection

Colds

Pneumonia

Smallpox

Streptococcus throat

Encephalitis

Influenza

Tuberculosis

Group II. Gastro-intestinal Tract

Typhoid

Paratyphoid

Dysentery

Undulant Fever

Cholera

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[1]/ Mckhann, C. F. and Steeger, A. L. "Hospital Infections, A Survey of the Problem." Am. J. Dis. Child, 55: 579 (March), 1938.

Group III. Skin and Mucous Surfaces

Erysipelas

Syphilis

Gonorrhea

Impetigo

Tularemia

Scabies

Ringworm

Leprosy

Group IV. Intermediary Vectors

Yellow Fever

Plague

Malaria

Relapsing Fever

Typhoid

Dengue

Rocky Mountain Spotted Fever

Typhus

C. METHODS OF CONTROL

There are three points in the spread of disease at which the problem of control of communicable diseases can be attacked:[1]

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[1] Feemster, R. F. "Control of Communicable Diseases," Communicable Diseases (Commonwealth of Mass. Dept. of Public Health, 1939), p. 6.

1. Eliminate the sources of infection commonly termed "the seed" or parasitic factor.

2. Break the chain of spread or "sower" factor.

3. Protect the susceptible or the "soil".

When these three factors are present an infectious disease will arise and depending upon their mutual inter working an epidemic or a pandemic will result.

In certain diseases one method of attack is by far the more profitable, for example, in diphtheria toxoid inoculations are very effective in protecting the susceptible host against the disease.[1]/ However, health officials are not content to depend entirely upon the method, but also supervise the source of infection and break every chain of spread possible.

Historically, one of the first measures instituted was to break the chain of spread in the environment.[2]/ A movement to provide pure water supplies was well underway by the time that bacteria were discovered. Sanitary disposal of sewage became an important public health measure. Foods are now inspected and milk is pasteurized to guard against any introduction or pathogenic bacteria. Thus we see that gains have been made in controlling disease in

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[1]/ Feemster, op. cit., p. 6.

[2]/ Feemster, op. cit., p. 6.

which the organisms can survive outside the human body.

A sanitary environment has very little influence upon the spread of highly communicable diseases, such as smallpox, influenza and measles. We must institute some means of protecting susceptible individuals. Vaccination is the answer for the control of smallpox.[1]/

A similar method of attack has resulted in the decrease of the incidence of diphtheria because we now have a means of increasing the immunity of individuals to such a degree that no child should ever have the disease. Certain other diseases can be prevented by this method of immunization and the future may add considerably more.

Insect-borne diseases constitute special problems.[2]/ Certain wood ticks, for example, are known to carry Rocky Mountain spotted fever. As long as these ticks remain free of this infection, they constitute no menace.

Diseases of animals also constitute certain special problems. Tuberculosis of cattle is being eliminated from dairy herds by the cattle owners and by the Government. Undulant fever can be eliminated by pasteurization of all milk. The control of rabies can be accomplished by the immunization of dogs with anti-rabic vaccine. Trichinosis

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[1]/ Feemster, op. cit., p. 7.

[2]/ Feemster, op. cit., p. 8.

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[1] Foemster, op. cit., p. 7.

[2] Foemster, op. cit., p. 8.

can be prevented by the thorough cooking of pork. Anthrax is a hazard which can be controlled by the proper handling of hides, furs, wools, and bristles.

While much can be done to prevent the spread of disease, no method is as yet perfect and every day persons become ill in spite of every precaution. The last line of defense may be the serum.

D. QUARANTINE AND ISOLATION

Quarantine is the limitation of freedom of movement of persons or animals who have been exposed to communicable diseases for a period of time equal to the longest usual incubation period of the disease to which they have been exposed.[1]/ The term is a derivation from the Italian "Quaranta", meaning forty, which represents the number of days to which vessels and their entire personnel were at one time detained and held under observation if they arrived from places infected with plague.

The term "isolation" refers to the separation of the patient from other persons, so as to prevent the direct or indirect conveyance of the infectious agent to susceptible persons.[2]/

1/ Gershenfeld, L. Bacteriology and Sanitary Science (Philadelphia, Lea and Febiger, 1933), p. 307.

2/ Ibid., p. 308.

To distinguish between the terms quarantine and isolation it may be said arbitrarily that quarantine describes the limitations put upon exposed individuals or contacts and that isolation describes the limitation put upon movements of the sick or carriers.

Theoretically all communicable diseases should be subject to some form of regulation, but practically only certain diseases require isolation by health authorities. Isolation is enforced in the following diseases because they are highly communicable, the etiological agent is unknown, or no better method of control is available.[1]/

Chicken pox	Mumps
Diphtheria	Poliomyelitis
Encephalitis, Epidemic	Scarlet fever
Influenza	Smallpox
Leprosy	Whooping cough
Measles	

E. TABLE OF INFECTIVE AGENTS, INCUBATION PERIODS, AND PERIODS OF COMMUNICABILITY FOR IMPORTANT DISEASES

Disease	Cause	Incubation period	P. of C.
Epidemic meningitis	Meningococcus	7 days (2-10)	Until organism is not present in secretion. About 2 weeks.
Polio-myelitis	Filtrable virus	7-14 days	Probably no more than 21 days including latter part of incubation.

1/ Gershenfeld, L. Bacteriology and Sanitary Science (Philadelphia, Lea and Febiger, 1933), p. 311.

Disease	Cause	Incubation period	P. of C.
Lobar pneumonia	pneumococcus	Not certain Probably 1-3 days	Unknown, probably variable
Pulmonary Tuberculosis	Tubercle bacillus	Long and variable	While organisms are discharged from lesions. (Open cases)
Leprosy	Leprosy bacillus	Long and unknown	Long (while lesions are open)
Typhoid fever	Typhoid bacillus	7-14 days (3-38)	Throughout the disease; until feces are free of bacilli.
Cholera	Cholera vibrio	3 days (1-5)	7 to 14 days. occasionally longer.
Amebic Dysentery	Endameba histolytica	2 days in acute cases; few weeks to few months in chronic cases.	Throughout the disease; as long as organisms are discharged.
Bacillary Dysentary	Dysentery bacillus	2-7 days	Throughout the disease; as long as bacteria are present in the feces.
Rabies	Filtrable virus	2-6 weeks	15 days before outset of symptons in dog and throughout course of disease.
Tetanus	Tetanus bacillus	4 days to 3 weeks	Rarely communicable from person to person.
Common cold	Filtrable virus	1-3 days	Less than 1 week from outset
Syphilis	Treponema pallidum	3 weeks (as long as 70 days)	Usually in primary and secondary stages Where lesions are open.
Gonorrhea	Gonococcus	3 to 5 days (1-8).	As long as organisms are present in discharges.

Disease	Cause	Incubation period	P. of C.
Smallpox	Filtrable virus	8 to 16 days (8-21)	From onset of symptoms to disappearance of lesions.
Chicken pox	Filtrable virus	2 to 3 weeks (11-20 days)	From appearance of skin lesion to end of first week.
Measles	Filtrable virus	10 days (7-18 days)	From onset of symptoms to 5 days after appearance of rash. (About 9 days)
Mumps	Filtrable virus	18 days (12-26 days)	Unknown. Probably until parotid swelling disappears.
Scarlet fever	Streptococcus scarlatine	3-4 days (2-7 days)	Extremely variable As long as the organisms are harbored in throat.
Septic sore throat	Streptococcus epidemicus	1 to 3 days	Indefinite and uncertain.
Whooping cough	Bacillus pertussis	7 to 10 days (7-16)	From onset of symptoms for 3-4 weeks.
Influenza	Filtrable virus	1-3 days	Uncertain; possible for 7 days after onset.
Diphtheria	Diphtheria bacillus	2-5 days	90% of cases for 1 to 4 weeks.

F. IMPORTANCE TO THE MORTICIAN

The mortician as a sanitarian should have a very general knowledge of communicable and contagious diseases. He should in general be aware of the causes of disease, the methods of transmission, the portals of entry and the exit of bacteria and of the methods of controls.

Specifically his knowledge must include the recognition of those dead of anterior poliomyelitis, diphtheria, meningococcus, smallpox, typhus fever, septic sore throat, cholera and similar highly communicative diseases. Those dead of these specific diseases require special preparation by the embalmer and certain specific rules and regulations are enforced by the State Department of Public Health in regard to the funeral itself.

Dead human bodies with dangerous surface lesions may be required by the Department to be shown only under sealed glass-paned burial cases. Certain very special regulations are also enforced if a body, dead of some infectious disease which is dangerous to the public health, is to be transferred or shipped.

The body of a person who has died of a communicable disease is for a considerable period of time following death a factor that must be thought of as a possible "seed" of infection. It is the duty and responsibility of the mortician to protect himself and the general public from any spreading of disease. This can only be accomplished by vigilant efforts on his part in regard to safety factors involved by a very keen understanding of communicable diseases.

G. UNIT SUMMARY

Questions for Review

1. Name 5 causes of disease.
2. Give 4 portals of entry.
3. List 5 avenues of discharge.
4. How are communicable diseases spread?
5. Distinguish between the terms "communicable disease" and "contagious disease".
6. Give one classification of communicable diseases.
7. Explain the three methods used to control the spread of communicable diseases.
8. Differentiate between the terms "quarantine" and "isolation".
9. What is the period of communicability for rabies, tetanus, leprosy, lobar pneumonia?
10. Discuss the question, "Of what importance in the study of communicable diseases to the mortician?

Projects

1. Obtain from your State Department of Public Health pertinent literature concerning communicable diseases.
2. What specific quarantine regulations are in force in your own community?
3. Tabulate the following information for each communicable disease listed below, according to the specific regulations in force.
   a. Confirmed by laboratory tests.
   b. Period of isolation or quarantine.
   c. Release.
   d. Placards.

e. Contacts.

f. Terminal disinfection.

Diseases to be Tabulated

Diphtheria.

Poliomyelitis.

Scarlet fever.

Measles.

Whooping Cough.

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IV. PUBLIC HEALTH ADMINISTRATION

> "It is the duty of the State to extend over the people its guardian care, that those who cannot or will not protect themselves may nevertheless be protected; and that those who can and desire to do it, may have the means of doing it more easily. This right and authority should be exercised by wise laws, wisely administered; and when this is neglected the State should be held answerable for the consequences of this neglect."
>
> Lemuel Shattuck

A. INTRODUCTION

Public Health administration is the science, based upon public health principles, of organized agencies for the purpose of improving the public welfare through disease prevention and health promotion.[1]/ At the present time public health administration in the United States is in its infancy. Certain practices and procedures have been very well established while others have not as yet received the test of time. Public health administration is constantly changing with the new advance in the field of preventive medicine and is ever broadening its scope in a sincere attempt to aid in "promoting the general welfare" of the people.

B. ADMINISTRATION OF FEDERAL HEALTH SERVICE

Under the provisions of the "Bill of Rights" the Federal Government has carried on important health activities

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1/Smillie, W. G. Preventive Medicine and Public Health (New York, Macmillan Co., 1946), p. 493/

throughout the country.

The Federal Government has only those powers which have been allocated by the several States. Jurisdiction is limited to certain areas and territories, hence the service of the Federal Government is in the main supervisory and consultative in function and it is the individual State that has authority for actual administration of public health. In 1912 the Congress authorized the U. S. Public Health service which has the following functions:[1]/

1. Investigation and research.
2. Improvement in methods of public health administration.
3. Distribution of federal aid to State and local departments.
4. Interstate control of sanitation and water pollution.

The Surgeon General is the administration officer of the service and he is advised by a National Health Advisory Council, consisting of fourteen members. The major functions of the Public Health Service are allocated to four departments:[2]/

1. Office of Surgeon General.
2. National Institute of Health.
3. Bureau of Medical Services.
4. Bureau of State Services.

1/ Smillie, op. cit., p. 517.

2/ Smillie, op. cit., p. 519.

C. ADMINISTRATION OF STATE HEALTH SERVICE

Each individual State of the Union is sovereign in matters of health administration. For this reason there is considerable difference in methods of control and supervision of public health matters in the various States.

The first State Health Department was established in Massachusetts in 1869 and by 1913 every State had some form of health administration.[1]/ The functions of the State Boards were at first advisory in nature, but gradually became executive and supervisory.

As a general rule the States place the supervision of public health matters in a State Department of Public Health. In some cases a Public Health Commissioner is appointed by the Governor for a specific term of years. He may be assisted by an advisory board.

Whatever the form of organization there is always a body of laws, commonly called the Sanitary Code or Public Health Law, which governs all public health matters within the State. In many States the public health laws parallel laws proposed by the United States Public Health Service. In 1939 this federal service presented nine minimum functions which form desirable standards for the State Department to follow:[2]/

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[1]/Belding, D. L. Public Health and Preventive Medicine (Boston, D. L. Belding, 1936), p. 27.

[2]/Ibid, p. 28.

1. Enactment of regulations, dealing with sanitation, disease control, and public health, which have the force of Law throughout the State.

2. Collection, tabulation and publication of vital statistics for each important political or health administration unit of the State and for the State as a whole.

3. Collection and distribution of information concerning preventable diseases through the State.

4. Maintenance of safe water supplies and control of the character of the disposal of human wastes for all communities of the State.

5. Establishment and enforcement of minimal standards for milk supplies.

6. Maintenance of central and necessary branch laboratories, for the standard functions of diagnostic, sanitary and chemical examination: production of therapeutic and prophylactic preparations, and their free distribution for public health purposes; establishment of standards for the conduct of diagnostic laboratories throughout the State; laboratory research each in the cause and means of contact of preventable diseases.

7. Supervision of local health activities.

8. Establishment and enforcement of minimun standards of performance of the work of health departments, particularly in respect to communities receiving State aid for public health.

9. Prescription of qualifications for certain public health personnel.

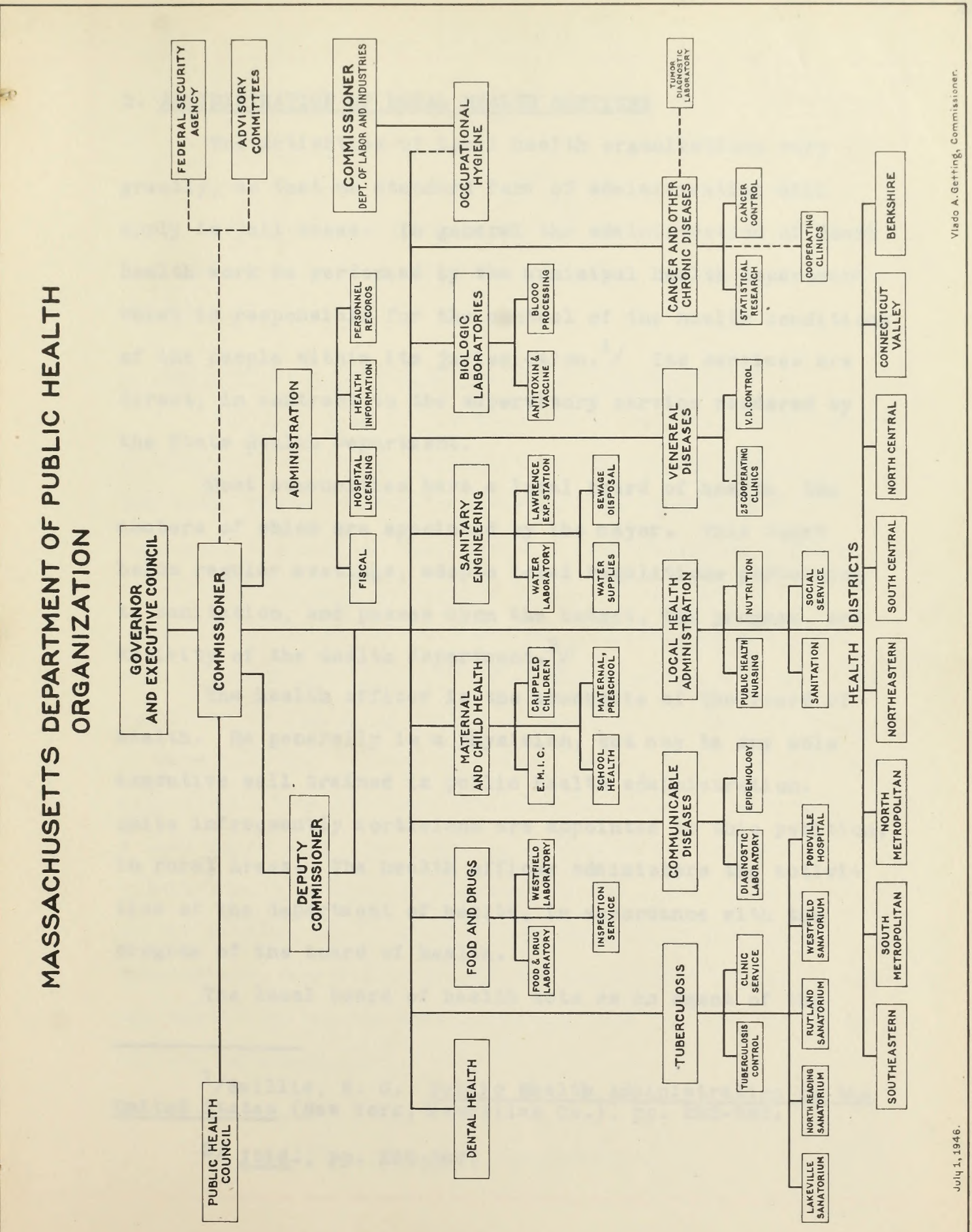
In general there are some ten distinct fields of activity that fall into the jurisdiction of the State Department of Public Health. The organization and administration of these activities vary considerably throughout the various states, but in general the activities include the following:[1]/

1. Vital statistics.
2. Communicable diseases.
3. Laboratories.
4. Sanitation.
5. Public health education.
6. Hygiene.
7. Mental hygiene.
8. Industrial hygiene.
9. Public health nursing.
10. Local health service.

The organization of the Massachusetts Department of Public Health is presented in the following chart and is representative of the typical State Public Health Department.

1/ Belding, op. cit., p. 29

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH ORGANIZATION



July 1, 1946.

Vlado A. Getting, Commissioner.

D. ADMINISTRATION OF LOCAL HEALTH SERVICES

The activities of local health organizations vary greatly, so that no standard form of administration will apply to all cases. In general the administration of local health work is performed by the municipal health department which is responsible for the control of the health conditions of the people within its jurisdiction.[1]/ Its services are direct, in contrast to the supervisory service rendered by the State Health Department.

Most communities have a local board of health, the members of which are appointed by the mayor. This board holds regular meetings, adopts local regulations pertaining to sanitation, and passes upon the budget, the program, and activity of the dealth department.[2]/

The health officer is the executive of the board of health. He generally is a physician, but may be any able executive well trained in public health administration. Quite infrequently morticians are appointed to this position, in rural areas. The health officer administers the activities of the department of health, in accordance with the program of the board of health.

The local board of health acts as an agent of the

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[1]/Smillie, W. G. Public Health Administration in the United States (New York, Macmillan Co.), pp. 282-285.

[2]/ Ibid., pp. 285-287.

State in performing certain functions such as administration of State laws, the control of communicable diseases, and the collection of vital statistics.[1]/ Its other activities include local public health laboratory services, sanitation of the environment, food and drugs, hygiene, nursing, and health education.

E. THE MORTICIAN IN PUBLIC HEALTH ADMINISTRATION

The mortician in his practice of embalming and funeral directing is under the jurisdiction and supervision of State and local public health authorities. He is required by law to pursue a course of instruction at an accredited college of Mortuary Science prescribed by the State. He is also required by law to pursue a period of apprenticeship under some licensed practitioner. When all requirements have been fulfilled to the satisfaction of the Board of Registration in Embalming and Funeral Directing, he may be registered and duly licensed to practice embalming and funeral directing of a dead human body. In order to establish and maintain an establishment be must be licensed by the local board of public health. He is at all times subject to the rules, regulations, and ordinances of the local board of health and any violations of the said rules may lead to revoking of his license to practice.

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1. Smillie, op. cit., pp. 289-295.

In a very practical way, the mortician is classified as a sanitarian and as such he has a moral and ethical obligation to maintain the public health. He is at all times in close contact with physicians, medical examiners, and members of the local and State boards of public health, in the daily operation of his business. As a sanitarian he may perform, during certain emergencies, activities of a public health nature. Because of his broad background in the field of sanitation and public health, he is often called upon to assume an executive position on the local board of health.

F. UNIT SUMMARY

Questions for Review

1. What are the functions of the United States Public Health Service?

2. Name the four departments of the United States Public Health Service.

3. What State inaugurated the first State Public Health Department?

4. Name several functions of the State Public Health Department.

5. Give ten activities of the State Department of Public Health.

6. What is the function of the Local Board of Health?

7. What are the duties of the local health officer?

8. What is the mortician's responsibility in performing certain duties to protect the health of the public?

Suggested Projects

1. Obtain a copy of the "Sanitary Code" of your community.

2. Discuss the organization and administration of your Local Health Department.

3. Make a chart of a typical State Department of Public Health, showing departmental organization.

4. Survey your own community and find out what activities of a public health nature, local embalmers and funeral directors have ever engaged in.

5. Visit your local public health laboratory and note all procedure.

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V. THE SANITARY SURVEY

The sanitary survey was first introduced and used as a teaching device by Dr. Milton J. Rosenau at Harvard Medical School. The device has gained in favor among graduate schools of Public Health throughout the country and is a very practical method of placing the student of public health and sanitary science in touch with practical procedures which are used in community living.

The survey was first used in a modified form by the Department of Public Health at the Boston School of Anatomy and Embalming in 1946 and has proved to be of considerable value in acquainting the student of mortuary science with the public health practices of procedures of the community in which he eventually hopes to practice.

GENERAL DIRECTIONS

1. The student is advised to select the community in which he will apprentice or will eventually practice; with the permission of the instructor another community may be chosen.

2. Data should be collected and tabulated following the outline and should be ready for oral presentation in class after each individual unit in this manual has been discussed.

3. The manner of collection of data is most important. The approach must be strictly ethical and in a courteous manner. If specific information is not available or accessible, do not press the issue, but rather state in the final form the reason for its omission.

4. Topics on the outline are intended as suggestions and represent only minimum requirements.

5. The final report is due at the end of the course and will constitute one half of the grade for the course in Public Health. The report will be either typewritten or in legible longhand and on white paper of a standard variety.

6. Any literature collected during the course may be included, but must be fastened in some secure way to the report.

7. The survey will be bound by cardboard and will include the collection of all the data and appropriate interpretation.

Sanitary Survey Outline

A. GENERAL DESCRIPTION OF COMMUNITY

1. Name of city, county, and State.
2. Resume of the history of the community.
3. Population.
4. Topography of the area.
5. Industries.
6. Form of Municipal Government.

7. List the number of funeral homes, registered embalmers and Licensed funeral directors.

B. VITAL STATISTICS

1. Death registrations.
   a. Methods of recording.
   b. Death rate of the community.
   c. Obtain death certificate and fill it out.
   d. Find the specific death rates for: typhoid, tuberculosis, scarlet fever, whooping cough.
2. Birth registration:
   a. Method of recording.
   b. Birth rate.
   c. Obtain birth certificate and fill it out.
3. Infant mortality:
   a. Methods of recording.
   b. Infant mortality rate.

C. ENVIRONMENTAL SANITATION

1. Water supply.
   a. Source of water and storage.
   b. Purification and treatment.
   c. Consumption of water per capita.
2. Disposal of wastes.
   a. Sewage treatment
   b. Garbage collection and disposal.
   c. Effect on health of neighboring communities.

3. Vermin

a. Mosquito control.

b. Rats and flies.

4. Food inspection

a. How food is inspected in your community.

b. List any packing houses or slaughter houses.

5. Sanitation

a. List sources of milk supply.

b. Dairies - numbers, inspections.

c. Pasteurization - regulations, methods.

6. Sanitary nuisances

a. List local regulations.

b. List all common nuisances in the community.

D. COMMUNICABLE DISEASES

1. List diseases of which notification is required.

2. Local quarantine regulations.

3. Tabulate the following information for each communicable disease according to the regulations in force.

a. Confirmed by laboratory tests.

b. Period of quarantine or isolation.

c. Placards.

d. Terminal disinfection.

Diseases to be Tabulated

1. Diphtheria

2. Scarlet fever

3. Typhoid

4. Measles

5. Chicken pox

6. Poliomyelitis

E. PUBLIC HEALTH ADMINISTRATION

1. Submit a chart showing the local set-up of your Department of Health.

2. Public Health Laboratories.

3. Tabulate typical activities of a public health nature carried on by local morticians.

F. GENERAL SUMMARY

1. Interpret your findings.

2. Criticize any unfavorable conditions found.

3. Make a list of possible recommendations.

GLOSSARY

ANTISEPTIC - Chemical agent which has the power of inhibiting bacterial growth.

ASEPSIS - A condition in which germs are prevented from contaminating an object.

BACTERIA - Unicellular plant organisms which do not contain chlorophyll or organized nuclei and usually divide by fission.

BACTERICIDES - Agents which kill bacteria.

BACTERIOSTASIS - The condition in which bacteria are prevented from multiplying.

CHLOROPHYLL - Coloring matter of green plants.

COAGULATION - The change from a liquid to a thickened state by chemical action.

COMMUNICABLE DISEASE - Those diseases whose causative agent is directly or indirectly transmitted from host to host.

CONCURRENT DISINFECTION - Application of disinfection to discharges immediately after leaving the body of an infected person.

CONTAGIOUS DISEASE - Those diseases that are spread from person to person.

DEODORANT - Substance which destroys, absorbs, neutralizes, disguises, or otherwise counteracts a noxious odor.

DESSICATION - The process of drying.

DISINFECTANT - Chemical agent which accomplishes disinfection.

DISINFECTION - Process whereby all germs capable of producing disease are destroyed.

DISTILLATION - A process of converting a substance into a gas and collecting it by condensation.

EPIDEMIOLOGY - The science that treats of epidemics.

EFFLUENT - Liquid material in sewage.

FLOCCULANT - A substance that promotes the collection of small particles into larger particles which are capable of settling.

FILTRATION - Process of removing bacteria by passing liquids through a material which holds back the bacteria.

FUMIGATION - Process whereby a room or enclosed space is subjected to the action of gases or fumes.

GERMICIDE - Chemical which kills germs.

HEMOLYSIN - Substance which causes the dissolving of red blood cells.

HOST - Animal or plant upon which a parasite lives.

IMMUNITY - Natural or acquired resistance to a disease.

ISOLATION - Separation of patient from others, so as to prevent the direct or indirect conveyance of infectious agent to susceptible persons.

INCUBATION PERIOD - Period intervening between the time of infection and the appearance of the disease.

INDIRECT CONTACT - Transfer of infection by means of inanimate objects.

INFECTION - Invasion of the body of pathogenic agents, the multiplication and production of the disease.

KOCH's POSTULATES - Statement of certain requirements that must be satisfied before a given organism can be said to be the cause of a certain disease.

MORBIDITY - Condition of being diseased.

MORTALITY - Condition of being dead.

PASTEURIZATION - Process used to check the growth of bacteria by heating to a certain temperature.

PATHOGENIC - Disease producing.

PHENOL COEFFICIENT - Figure used to indicate strengths of antiseptics and disinfectants as compared with phenol.

POLLUTION - Process of rendering unclean or impure by adding harmful bacteria.

PORTAL OF ENTRY - A point at which pathogens enter the body.

PUBLIC HEALTH - The science of improving public welfare through disease prevention and health promotion.

PUTREFACTION - The decomposition of protein material in the absence of oxygen with resultant odors.

QUARANTINE - Limitation of freedom of movement exposed to the possibility of infection.

SANITARY CODE - Set of rules and regulations established by a State to control public health activities.

SANITARY SCIENCE - Part of public health which deals with the influence of environmental conditions upon the health and life of individuals.

SANITARY NUISANCE - Any act which endangers life or health, gives offense to the senses, violates decency, or obstructs the reasonable and comfortable use of another's property.

SEDIMENTATION - Process by which suspended particles settle to the bottom of a liquis.

SERUM - Material which produces a passive immunity; primary purpose is to cure a person already ill.

SEWAGE - Material carried away by sewers.

SEWERAGE - Plumbing system used to carry away excreta.

SLUDGE - Solid material in sewage.

STERILIZATION - Process whereby life within certain confines is destroyed.

TERMINAL DISINFECTION - Final disinfection of the environment so that it is no longer a source for conveying infectious agents to others.

THERMAL DEATH POINT - The temperature which kills a liquid culture of some species of bacteria in ten minutes.

TOXIN - Poisonous material found in a secretion produced by vegetable and animal organisms.

VACCINE - Material which produces an active immunity; primary purpose is to protect a person from a disease.

VECTOR - An organism that carries Pathogens either mechanically or biologically to man.

VERMIN - Noxious insects and small animals that transmit disease.

VITAL STATISTICS - Science which considers the application of numerical methods to vital facts.

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